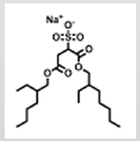
Oil Dispersant Effectiveness

The effect of surfactant composition on the percent of oil dispersed in sea water

Overview

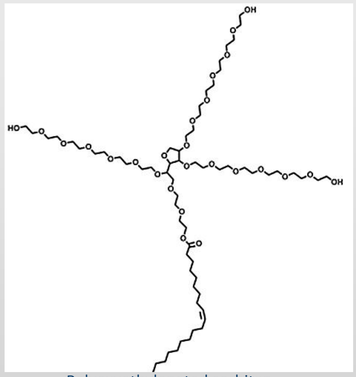
One approach in reducing the adverse effects of oil spills is to introduce chemical dispersants, reduce the toxicity of the crude oil by reducing its concentration.

Dispersants are composed of surfactants, including:



Doictyl Sodium Sulfosuccinate (DOSS)

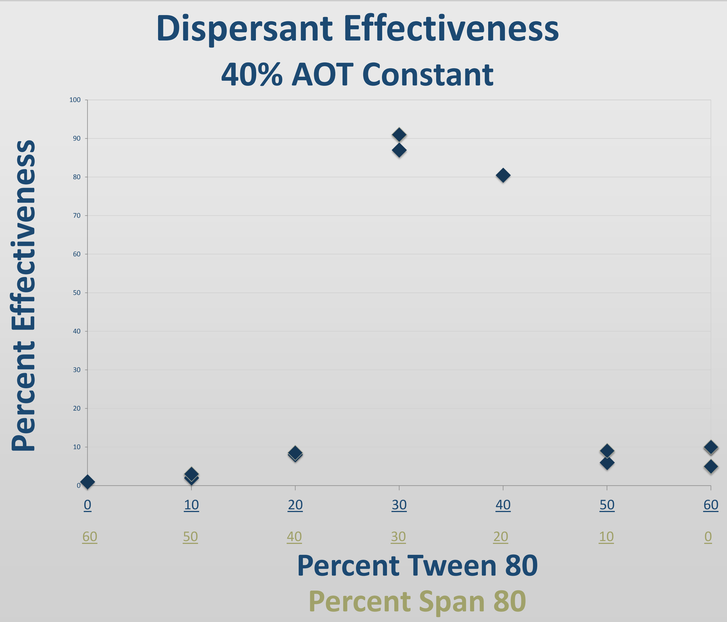
Sorbitol monooleate (Span 80)



Polyoxyethylenated sorbitan monooleate (Tween 80)

Surfactants affect the physical properties of the oil-water interface, allowing the oil to disperse within the water. Differing ratios of these chemicals produce varying amounts of oil dispersed. This oil is can be extracted and its absorbance measured compared to a 100% dispersion calibration to suggest compositional effectiveness.

Results



Conclusions

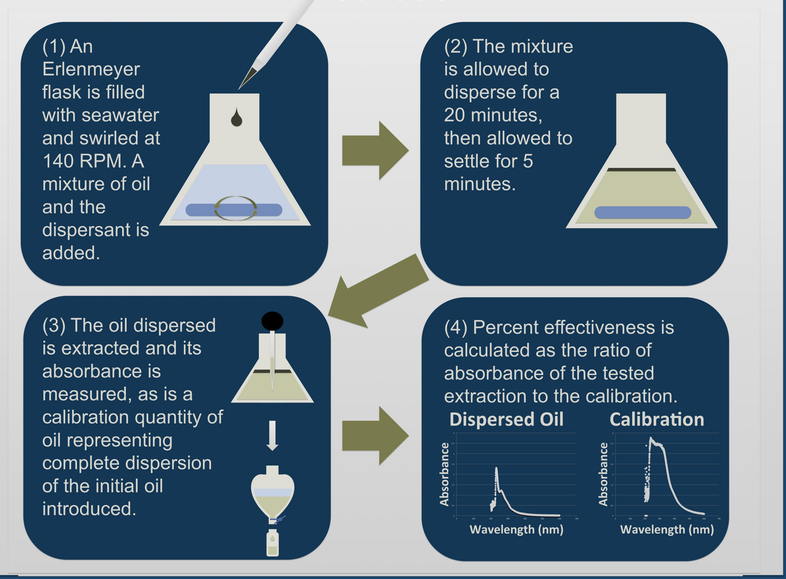
A composition of peak effectiveness was identified using a dispersion of 40% AOT, 30% Tween 80, and 30% Span 80.

Tested levels yield insight into the effectiveness of various regions of the surfactant composition area.

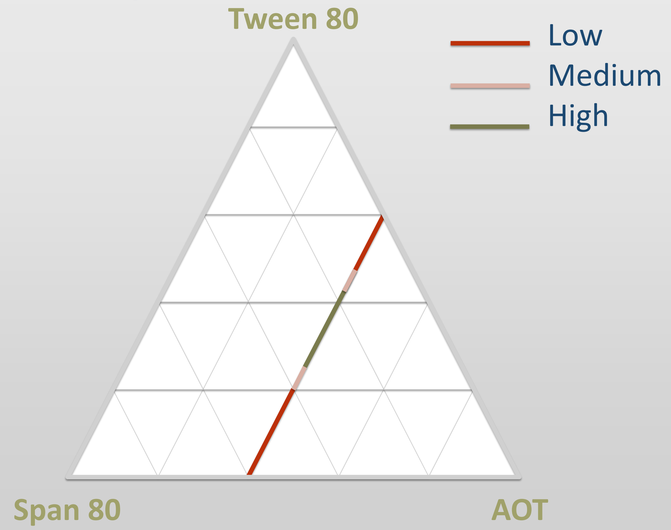
Effectiveness levels are consistent with previous work in the field, attesting to the validity of the research.

Further research can explore more of the compositional area and compare trends to effects of each surfactant on physical properties of the oil-water interface to determine their function.

Methods



Compositional Effectiveness



References

Brochu, C., E. Pelletier, G. Caron, and J.E. Desnoyers. “Dispersion of crude oil in seawater: The role of synthetic surfactants.” Oil Chem. Pollut., 3, 257-279 (1986/87)

Canevari, G.P. “A Review of the Relationship Between the Characteristics of Spilled Oil and Dispersant Effectiveness.” Oil Spill Chemical Dispersants. Tom E. Allen, ed. STP 840, ASTM International, Philadelphia, PA. 1984.

“Swirling Flask Dispersant Effectiveness Test, Revised Standard Dispersant Toxicity Test, and Bioremediation Agent Effectiveness Test.” Appendix C to 40 CFR 300. 1994.

Reihm, David. “Elucidating the Fundamental Mechanisms of Chemical Oil Spill Dispersion.” 18 February 2013.

Clayton, Jr., J.R.; Payne, J.R.; Farlow, J.S. Oil Spill Dispersants: Mechanisms of Action and Laboratory Tests; CRC Press, Inc.: Boca Raton, FL, 1993.

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